

High-Resolution Model Simulations of Tornadic Storms Over Florida during Tropical Storm Gabrielle (2001)

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On the morning of 14 September 2001, four tornadoes associated with the outer rainbands of Tropical Storm Gabrielle struck Brevard county in east-central Florida, resulting in several swaths of damage. Three of the tornadoes were F0 on the Fujita scale, and one reached F1 intensity as it moved through the town of Cocoa, FL, causing significant damage to multiple homes and businesses. Three of these tornadoes were associated with the same mini-supercell as it moved onshore through Brevard county's coastal zone, crossing barrier islands and an intercoastal waterway while advancing several miles inland.

Together with the Applied Meteorology Unit (AMU) operated by ENSCO Inc., the National Weather Service at Melbourne, FL (NWS MLB) configured a local, real-time adaptation of the Advanced Regional Prediction System (ARPS) Data Analysis System (ADAS) to facilitate nowcasting and short-term forecasting efforts during hazardous weather situations. The ADAS was modified to assimilate nationally and locally available in-situ and remotely-sensed observational data, including Level II Weather Surveillance Radar-1988 Doppler (WSR-88D) data, into a series of high-resolution gridded analyses every 15 minutes. Previous presentations have highlighted the utility of these high-resolution diagnostic fields in assisting NWS MLB forecasters during the severe weather situation associated with Gabrielle.

More recently, the AMU and NWS MLB have combined efforts to implement an operational version of the ARPS numerical weather prediction (NWP) model to serve as short-range guidance for convective initiation, sea breezes, and other meso- and convective-scale phenomena. The ARPS NWP model is currently run in real time at NWS MLB with 4-km grid spacing across the entire Florida peninsula on a 20-processor Linux cluster. Observational data are intermittently assimilated to produce the initial condition, using the ADAS configuration described above.

The operational ARPS configuration was run in post-analysis mode on the Tropical Storm Gabrielle tornadic event using all operationally available observational data for the initial condition, about 2-3 hours prior to the tornadoes. Using just a cold-start ADAS initialization, the ARPS NWP model successfully developed distinct supercells over east-central Florida at about the same time as the observed event. For this talk, the authors will present the results of the ARPS simulations of the tornadic storms associated with Gabrielle. The importance of incorporating Level II WSR-88D reflectivity and radial velocity data into the initial condition will be illustrated, including the contributions from all Florida radar sites available during the event.

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